

SEAMAP Survey Information Template

Agency:

National Marine Fisheries Service

Name of Survey:

SEAMAP Fall Plankton Survey

Cost of Survey, Source(s) and Amount(s) of Specific Funding: Please provide the total cost of this survey, including details on the specific sources of funding that support this survey (SEAMAP, State, Federal) and how much funding is provided by each source.

Information provided elsewhere

General Geographic Area Surveyed: Provide information on the general area sampled, such as inshore, nearshore, EEZ, other.

Inshore waters to the outer boundary of the United States continental shelf, from Brownsville, TX to Key West, FL.

Latitude/Longitude of Sampling Area: Provide the range of latitude/longitude of sampling area, if known. Provide maps of sampling stations.

Longitudinal range of sampling is 98.00 to 81.00 degrees west, and latitudinal range is 30.50 to 24.50 degrees north. The distribution of standard sampling stations from the survey is shown below.

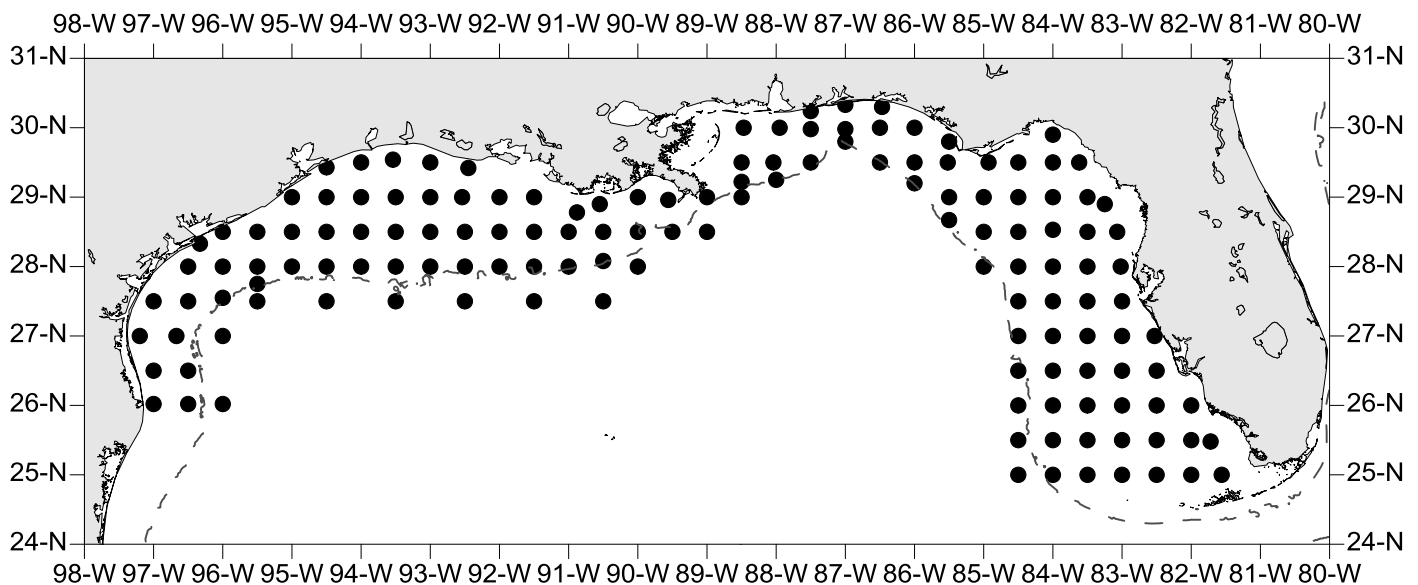


Figure 1. Standard SEAMAP Fall Plankton Survey sampling stations.

Dates of Survey: List specific dates of survey for 2009 or general dates if it varies annually.

The survey has been conducted annually since 1986 from late August to mid October.

Objectives: List goals and objectives of the survey.

Assess the occurrence, abundance and geographic distribution of the early life stages of fall spawning fishes, decapod crustacean larvae and major taxa of invertebrate zooplankton.

Obtain in situ physical oceanographic and environmental data to describe the pelagic habitat of fish larvae, decapod crustacean larvae and invertebrate zooplankton.

Sampling Gear: Describe the sampling gear.

Primary biological sampling is done using SEAMAP 61 cm bongo and 1 x 2 m neuston nets. Bongo nets are fitted with 0.335 mm mesh nets and neuston nets with 0.947 mm mesh nets.

Conductivity, temperature and depth profilers (CTDs) optionally equipped with dissolved oxygen, turbidity and fluorometry sensors are used to profile the water column.

Hydrographic bottle casts are used to obtain replicate water samples from surface, mid and/or maximum chlorophyll layer and near bottom or to a maximum depth of 200m.

A Flow-through thermosalinograph system equipped with a fluorometer is used to obtain along track near surface measurements while the vessel is underway.

A Turner Designs 10-AU-005 benchtop fluorometer with a 10-040R optical kit for the analysis of chlorophyll a samples.

Continuous Underway Fish Egg Sampler (CUFES) that collects along track plankton samples at regular intervals.

Multiple Opening and Closing Net Environmental Sensing System (MOCNESS) to measure the vertical distribution of fish larvae and invertebrate zooplankton at discrete depths.

Methot juvenile fish trawl for the collection of postlarval and juvenile fishes not represented in bongo and/or neuston nets.

Targeted Species: Provide the major species targeted by the survey.

The survey targets all fall spawning fishes with pelagic larvae, decapod crustacean larvae and major taxa of invertebrate zooplankton. Species occurring during the survey include (*Lutjanus campechanus*), vermillion snapper (*Rhomboplites aurorubens*), gray triggerfish (*Balistes capriscus*) and king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*) and red drum (*Sciaenops ocellatus*).

Target Habitat: Provide the habitat targeted by the survey, if applicable.

The survey targets the pelagic habitat of fish eggs and larvae, decapod crustacean larvae and major taxa of invertebrate zooplankton at the surface interface with neuston collections, and the water column from the surface to near bottom or a maximum depth of 200m with bongo collections.

CUFES sampling targets near surface invertebrate zooplankton and fish eggs.

MOCNESS sampling targets invertebrate zooplankton, fish eggs and larvae at discrete depths in the water column.

Methot sampling targets postlarval and juvenile fishes that are not effectively caught in bongo, neuston and MOCNESS samples.

Site Selection Methods: Explain the method for selecting sampling locations, such as stratified random, random sampling, transects, etc.

Plankton sampling is conducted at predetermined stations arranged in a fixed, systematic grid. Most grid locations or SEAMAP stations (designated by a unique SEAMAP or 'B' number) are located at <56 km or 0.5 degree intervals along the grid. See Figure 1.

Sampling Methods: Provide any additional specific information on sampling methods, such as soak time, trawl times, etc.

Ichthyoplankton sample and data collection were implemented in accordance with procedures outlined in the SEAMAP data collections manual. A Primary station operations consisted of a CTD profile, a neuston tow and every other station, a bongo tow with attached (on towing cable above the frame) SEACAT Profiler. Bongo samples were taken with the standard SEAMAP 61 cm bongo outfitted with two 0.335 mm mesh nets and towed in an oblique path from near bottom or 200 m maximum depth to the surface. Vessel speed was adjusted during the bongo tow to maintain a 45-degree wire angle in order to uniformly sample the water column. Water temperature, salinity and depth were monitored and recorded real-time during each bongo tow. Each bongo net had a flowmeter mounted inside to measure the volume filtered during the oblique tow. Neuston samples were taken using a 0.947 mm mesh net attached to a 1 x 2 m metal frame and towed for 10 minutes at a vessel speed (~ 2 knts) sufficient to keep the net opening half submerged in the water and thus maintaining a sampling depth of 0.5 m. Tows were shortened to no less than 5 minutes if *Sargassum* began to accumulate in the net and make retrieval onto the deck difficult. Right bongo samples were initially preserved in 10% formalin and transferred to new 95% Ethanol (ETOH) after 36 hours. Left bongo and neuston samples were initially preserved in 95% ETOH and transferred to fresh ETOH after 24 hours.

Environmental data were collected at each designated ichthyoplankton station in accordance with procedures outlined in the SEAMAP data collections manual. Each station included a CTD cast to near bottom or a maximum depth of 200 m. The Seabird SBE 9/11 Plus CTD with digiquartz pressure sensor was used with temperature sensor, conductivity sensor, dissolved oxygen sensor, fluorometer and transmissometer. Information from shipboard sensors was accessed via the Scientific Computer System (SCS), which continuously displayed and recorded the ship's position, heading, speed, wind direction, wind speed, barometric pressure, sea surface temperature, air temperature and water depth. Water samples were taken, using Niskin bottles attached to a carousel sampler, at the surface, midwater or chlorophyll maximum, and near-bottom (up to 200 m maximum) for bench top fluorometric analysis using a modified Welshmeyer method. The modified procedure uses a Turner Designs 10-AU-005 benchtop fluorometer with a 10-040R optical kit.

The CUFES system includes a submersible pump, concentrator, and sample collector. Water is pumped from the ship's sea chest located ~4 m below the surface to the concentrator at a calibrated flow rate. The sample is then concentrated through a 505 mesh filter. Samples are taken approximately every 30 minutes while the ship is underway between stations. All samples are preserved in 95% ethanol. Environmental data including surface temperature, salinity and fluorescence from the ships thermosalinograph is logged continuously for the 30 minute sample.

The MOCNESS carries nine 0.505 mm mesh nets. The nets are tow in real time. Net depth, temperature, salinity, angel and volume filtered are continually monitored. Net 1 is towed obliquely from the surface to the maximum depth of tow. Nets 2 to 9 are towed obliquely through discreet depth ranges. Winch and ship speed

are maintained at rates that result in a filtered water volume of ~250 m³ for nets 2 to 9. Samples from net 1 are preserved in 10% formalin and transferred to 95% ethanol after at least 36 hours. The remaining samples (nets 2 to 9) are initially preserved in 95% ethanol and transferred to fresh ethanol after 24 hours.

The Methot trawl is a 2.32 x 2.24 rigid frame outfitted with a 14.3 m long 3mm knotless mesh net. The gear is fished either horizontally through the water column at a fixed depth, or a stepped oblique manner from maximum depth. A flow meter mounted inside the net measures the volume filtered during the tow. Depth of tow is monitored with a time, depth recorder (TDR) or a SIMRAD temperature-depth sensor. Samples are preserved in 95 % ethanol or 5% formalin depending of the amount of gelatinous organisms. Samples are transferred to fresh 95% ethanol after 24 hrs if initially preserved in ethanol, or after 36 hrs if initially preserved in formalin.

Data Collected: Provide a list of biological, environmental, habitat, and any other data collected consistently on the survey.

Station information including date, time zone, start/end time of sampling, start/end water depth of sampling, ship's speed, wind speed, wind direction, sea state, barometric pressure, sea surface temperature and air temperature.

Plankton samples containing pelagic invertebrates, fish eggs and larvae. The presence/absence and/or number of jellyfish recorded for each plankton sample. Likewise, the presence/absence and the amount of *Sargassum* are recorded for each plankton sample.

Water column profiles including salinity, temperature, depth, dissolved oxygen, turbidity, and fluorescence.

Visual observations including cloud cover, amount of precipitation and water color.

Deviations from SEAMAP Protocols: Provide details on any deviations from approved SEAMAP sampling protocols.

Jellyfish and Sargassum information for each plankton sample is taken in addition to the SEAMAP requirements.

Plankton collections with CUFES, MOCNESS and Methot nets are done as time permits, and supplement the information gathered with the standard SEAMAP gear.

The analysis of chlorophyll a using bench-top fluorometry is in addition to the SEAMAP requirements.

Logistical Challenges: If there are any specific logistical challenges that influence your survey methods please explain.

Draft limitations of NOAA vessels restrict sampling in water less 12 to 15 meters, limiting our ability to effectively sample the coastal areas of the shelf.

Use of Data: Please provide specific details on the use of all data collected during this survey, including use in stock assessments and management activities.

The ichthyoplankton data and specimens generated by these surveys are or have been used to develop identification guides for the early life stages of fishes; characterize distribution, occurrence and abundance; infer spawning seasonality; provide an alternate means of predicting/identifying locations of spawning habitat;

identify 'sources' and sinks' of recruits; and quantify the impact of entrainment mortality by liquefied natural gas facilities (LNG); provide historical data for input into models estimating the impact of the Deepwater Horizon oil spill event in 2010; characterize the distribution, occurrence and abundance of decapod crustacean larvae and major taxa of invertebrate zooplankton.

Fishery-independent larval indices of abundance have been developed from the survey time-series for red snapper (*Lutjanus campechanus*), vermillion snapper (*Rhomboplites aurorubens*), gray triggerfish (*Balistes caprisкус*) and king mackerel (*Scomberomorus cavalla*). The red snapper and king mackerel indices of abundance are currently incorporated the latest stock assessment models for these species.

Data Gaps: Please provide information on any gaps in the data collected by this survey, including an explanation of why data gaps exist and potential methods to fill data gaps.

Limited coverage of inshore areas of the shelf due to vessel limitations

International boundaries limit the survey to the U.S. continental shelf.

Future Modifications: Please explain any proposed future modifications to this survey.

Future modifications to the survey should focus on increasing the number of samples, inshore sampling to target coastal spawning fishes and cooperative work with Mexico to expand coverage into the southern GOM.